Customer No.: 31561
Application No.: 10/710,598
Docket No.: 13113-US-PA

REMARKS

Present Status of the Application

The Examiner's indication of allowable subject matter in claims 4-7 is noted with great appreciation and that they would be allowed if rewritten or amended into independent form including all the limitations of the base claim and any intervening claims.

Claims 1-13 remain pending of which claim 8 has been amended to correct a minor informality and claims 11-13 have been newly added to more explicitly describe the claimed invention. Claim 11 is fully supported at paragraph [0045]. Therefore, it is believed that no new matter adds by way of amendment to claims or otherwise to the application.

For at least the following reasons, Applicant respectfully submits that claims 1-113 are in proper condition for allowance. Reconsideration is respectfully requested.

Discussion of the claim rejection under 35 USC 103

The Office Action rejected claims 1-3 and 8-10 under 35 U.S.C. 103(a) as being unpatentable over Sawai et al. (US-5,898,527, hereinafter Sawai).

Applicants respectfully disagree and traverse the above rejections as set forth below.

The present invention is directed to an optical lens and a lens system. The proposed independent claim 1, among other things, recites at least [a first lens, disposed in the

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receiving space, wherein the first lens comprises a first outer loop and at least one protrusion, wherein the protrusion is disposed on the first outer loop, and a portion of the first lens is exposed by the light incidence opening; and a second lens, disposed in the receiving space and lodged to the first lens, wherein the second lens comprises a second outer loop and at least one recess, wherein the recess is disposed on the second outer loop, the first outer loop is leant on the second outer loop, and the protrusion is lodged to the recess]. The advantage of the above recited features is that at least the eccentric shifting of the optical axis of the lens system can be effectively reduced.

In rejecting the above claims, the Examiner stated that Sawai teaches every features of the claimed invention except for the second lens comprises a second outer loop and at least one recess disposed on the second outer loop and the protrusion is lodged to the recess. However, Sawai discloses that the lens further comprises an annular flat surface around the second lens surface forming a recess relative to the second lens surface. Therefore, it would have been obvious to one skilled in the art at the time of the invention to provide a lens with recessed surface into the lens barrel for the purposes of a pair of decentered lenses to be held into one lens barrel conveniently as taught by Sawai.

Applicants respectfully disagree and submit that the Examiner has misunderstood that the recess formed on the second outer loop of the second lens of the claimed invention is lodged to the protrusion of the lens barrel for fixing the second barrel into the lens barrel. According to the claimed invention as claimed in claim 1, the protrusion disposed on the outer loop of the first lens is lodged to the recessed disposed on the

second outer loop of the second lens. Thus, Sawai, in a manner suggested by the Examiner cannot possibly render the claimed invention obvious in this regard.

Because the proposed independent claim 8 also recite features that are similar to the proposed independent claim 1, therefore Applicants similarly submit that claim 8 also patently defines over Sawai for at least the same reasons discussed above.

Furthermore, Applicants have added a new independent claim 11, which besides reciting features similar to claim 1, further recites at least [the protrusion disposed on the first outer loop of the first lens is lodged to the recess disposed on the second outer loop of the second lens such that the optical axes of the first and second lenses substantially coincide with each other].

Applicants respectfully submit that the present inventors have recognized that the two lenses in a conventional optical system are individually fixed within the lens barrel, and the image quality is dependent on the precision of the alignment of the two lenses as it is preferable that the optical axes of both lenses be coincident. Since the alignment precision of the lenses is influenced by the machining precision of the inner wall of the lens barrel, the machining of the lens barrel is implemented by using the computer numerical control (CNC) lathe or the CNC boring machine. However, generally the finest machining precision of the inner wall of the lens barrel may be achieved for lens dimension up to about 10μm level. Therefore, the alignment error will occur for lens dimension smaller than 5μm. In order to remedy this problem, the present inventors propose designing the structure of the two lenses and then assembling the two lenses together such that the optical axes of the two lenses substantially coincide. More

specifically, the present inventors propose a first lens comprising a first outer loop and at least one protrusion disposed on the first outer loop; and a second lens comprising a second outer loop and at least one recess disposed on the second outer loop. The first and second lenses are assembled together by lodging the protrusion disposed on the first outer loop of the first lens in to the recess disposed on the outer loop of the second lens so that the optical axes of the first and second lenses substantially coincide with each other. In other words, the structure of the first and second lenses according to the present invention allows alignment of the optical axes of the first and second lenses to be independent of the precision of the inner wall of the lens barrel. According to the present inventors, because a high manufacturing precision of the protrusion and the recess, disposed on the first outer loop and the second outer loop of the first lens and the second lens respectively, can be achieved for dimension less than about 0.2μm level, therefore the alignment error of the first and second lenses according to the present invention is extremely small. Therefore, the eccentric shifting of the optical axis can be effectively reduced compared to the conventional optical system.

Instead, Sawai, at FIG. 7, col. 12, lines 31-38, substantially teaches a lens 50 can be directly pressed by a lens 58 adjacent to the lens 50 through the center, peripheral portion or entire surface of the lens 50 and an annular member 51 equipped with an outer screw that screws the inner circumferential surface of the lens barrel may be used for fixing the lenses 50 and 58 within the lens barrel. Furthermore, with reference to FIG. 21, col. 22, lines 41-59, Sawai substantially teaches a method of holding of three decentered lenses within the lens barrel so as to coincide all the centering axes of the

three decentered lenses at one time. According to Sawai, with regard to two arbitrary decentered lenses out of three, because there exist a total of four centers of curvature thereof with each lens having two centers of curvature, there can exist a total of four straight lines therebetween which are made by connecting arbitrary one of two centers of curvature of one decentered lens and arbitrary one of two centers of curvature of the other decentered lens. First, one of the four straight lines is arbitrarily selected, and is set to be a common centering axis for the two lenses. Next, a third decentered lens is so positioned with respect to the two decentered lenses that arbitrary one of two centers of curvature of the third decentered lens is located on the common centering axis. With these steps, the three decentered lenses can be easily arranged on one common centering axis. In other words, as clearly illustrated in FIG. 21, that the three decentered lenses are individually positioned and fixed to the inner wall of the lens barrel, therefore Sawai cannot possibly teach, suggest or hint assembling the two (or three) lenses together by lodging the protrusion disposed on the outer loop of one of the lenses into the recess disposed on the outer loop of the other lens so that the optical axes of the lenses substantially coincide with each other, instead Sawai substantially teaches a complex method of individually arranging the lenses in the lens barrel and a method for coinciding the optical axes of the lenses to a common centering axis as described above. Thus, it is clear that Sawai teaches away from the claimed invention in this regard.

Therefore, Applicants respectfully submit that Sawai can not possibly render every features of the proposed independent claim 11 obvious in this regard.

Claims 2-3, 9-10 and 12-13, which directly or indirectly depend from independent Claims 1, 8 and 11, respectively, are also patentable over Sawai at least because of their dependency from an allowable base claim.

For at least the foregoing reasons, Applicant respectfully submits that claims 1-3 and 8-13 patently define over Sawai. Reconsideration and withdrawal of above rejections is respectfully requested.

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CONCLUSION

For at least the foregoing reasons, it is believed that all pending claims 1-13 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

Respectfully submitted,

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